Small And Large Intestines

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Lecture (3) – Last updated: May 2013

Objectives:

- **Basic anatomy, to identify**
  - **Parts of the Small intestine.**
  - **Differences between jejunum and ileum.**
  - **Differences between small and large intestine: internal features.**
  - **Differences between small and large intestine: external features.**
  - **Parts of the large intestine.**
  - **Blood supply and innervation of the intestine.**

- **Clinical anatomy, to define:**
  - **Endoscopic view: termial ileum as an example.**
  - **Meckel's Diverticulum.**
  - **Volvulus:**
  - **Intussusception:**
- **Surface anatomy:**
  - **Mcburney's Point**
- **Radiology:**
  - **Normal X-ray for the large intestine (using barium)**

Note: the following are not considered in this lecture because of the mention justifications:

- **Duodenum: has been mentioned in the previous lecture.**
- **Rectum and anal canal: will be considered in the section of the pelvis.**

Think About This

- Hiba is a 22 years-old university student, presented to Ibraheem Malik Hospital with severe abdominal pain, she said the pain had started in the center of the abdomen before it became localized to the right iliac fossa. She was complaining of Nausea and vomiting.
- O/E she was ill, laying with the right hip flexed (the psoas sign) Pulse rate 90 bpm, respiratory rate 28 breath/minute, when asked to describe the location of the pain, she has pointed to where the pain began and where it moved (the pointing sign). The doctor detected pain in the right iliac fossa among palpation of the left iliac fossa (Rovsing's sign).
- He requested blood count for white blood cells and U/S, after viewing the results, he made the diagnosis of acute appendicitis.

By The End Of This Lecture, Try To Answer These Questions About The Previous Story:

- Why did the pain (move) from the center of the abdomen at first to the right iliac fossa?
- Describe the anatomical explanations for the following signs of acute appendicitis:
    - The psoas sign.
    - The pointing sign.
    - Rovsing's sign.
- Describe the location of the McBurney's point.
- How can the surgeon find the base of the appendix during appendicectomy?
- What are the possible locations of the tip of the appendix?

Introduction: lecture's map

- **Small intestine:**
    - **Differences between jejunum and ileum.**
    - **Differences between small and large intestine: internal features.**
- **Large intestine:**
    - **Differences between small and large intestine: external features.**
    - **Cecum.**
    - **Appendix.**
    - **Colon.**
- **Blood supply and innervation.**

Small Intestine

- The average length is 6.5 meters.
- Resection of up to one third or even half of the small intestine is compatible with a perfectly normal life.

Small Intestine

- **Duodenum.**
- **Jejunum.**
- **Ileum.**

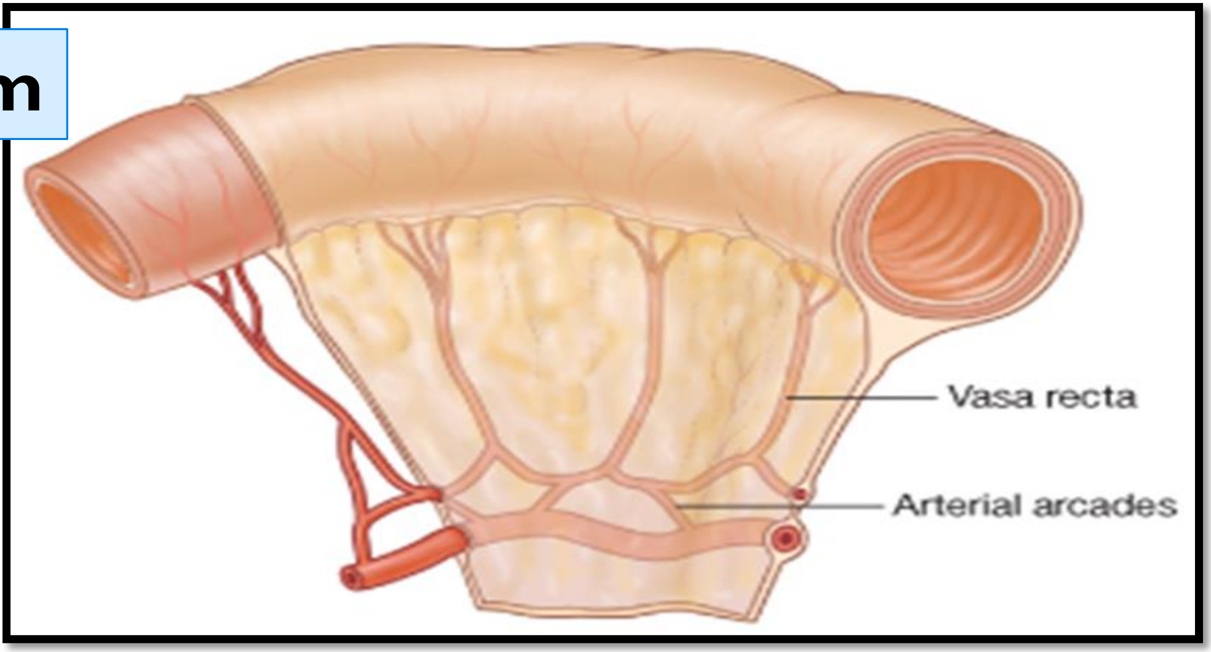
Differences Between Jejunum And Ileum

- **Location.**
- **The wall.**
- **Diameter.**
- **Mesentery.**
- **Arcades.**

	Jejunum	Ileum
Location	In the left upper quadrant of the abdomen	In the right lower quadrant of the abdomen
The wall	Thicker	Thinner
Diameter	larger	Smaller
Mesentery	Less mesenteric fat	More mesenteric fat
Vasa recta	Longer	Shorter
Arcades	Less	More

Differences: Arcades

Jejunum



Ileum

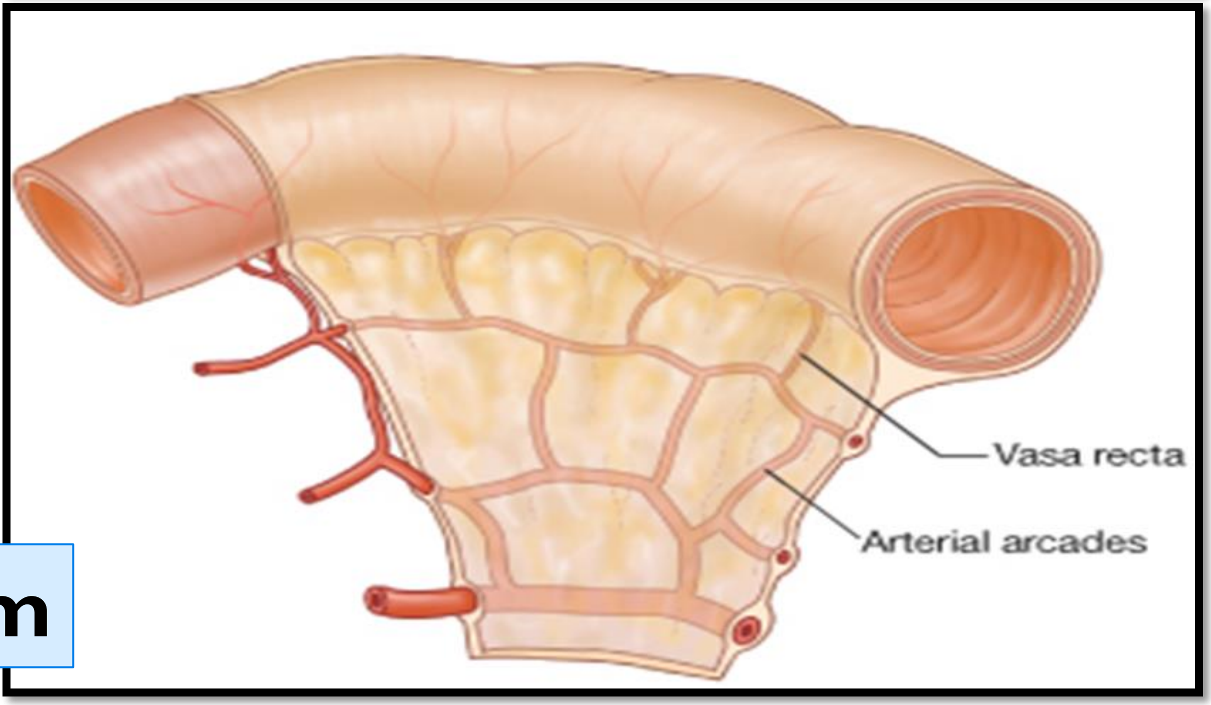
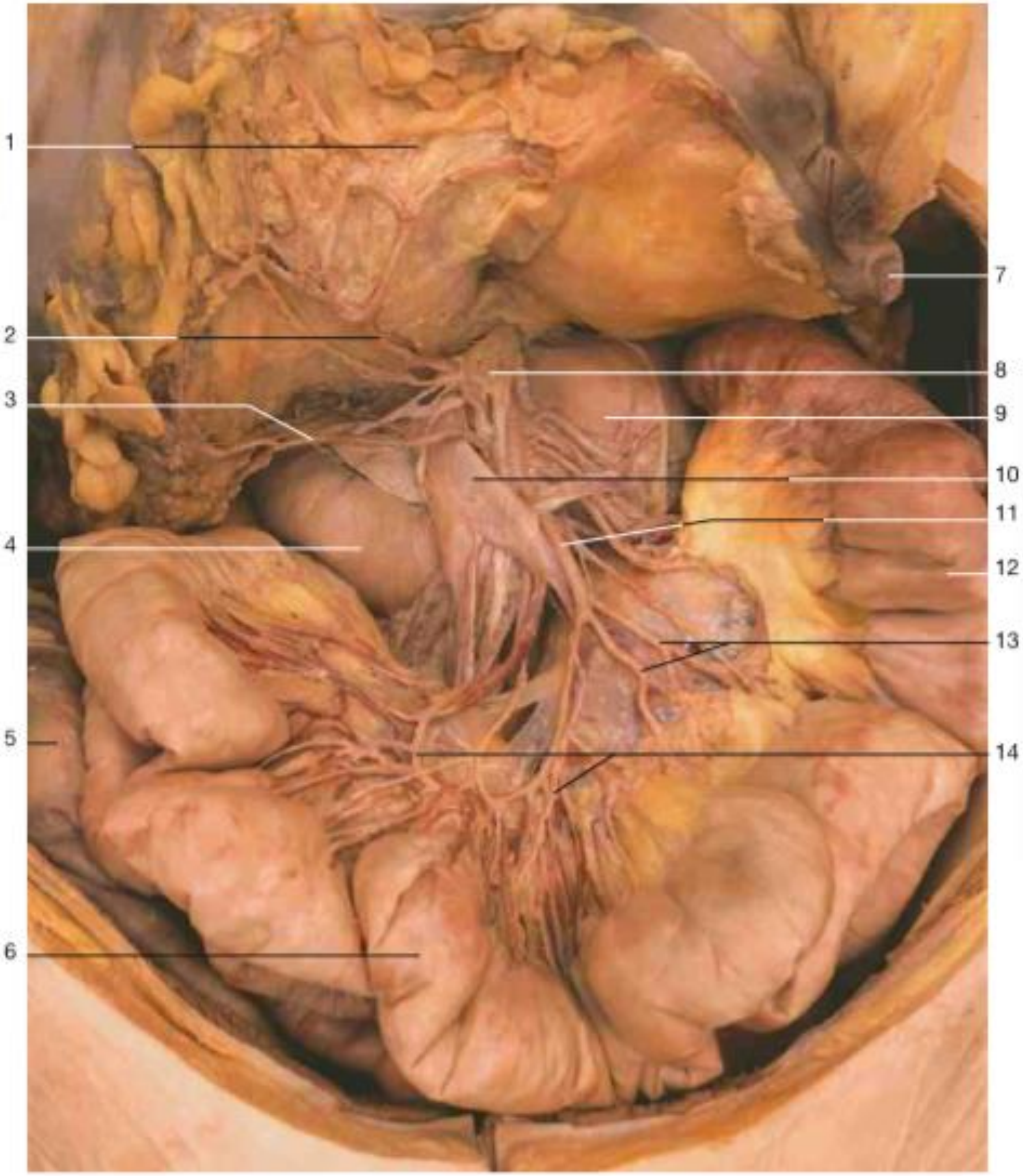


Image from: Richard L.Drake, Wayne Vogl,Adam W.M.Mitchell, GRAYS anatomy for students, Elsevier Inc. 2007

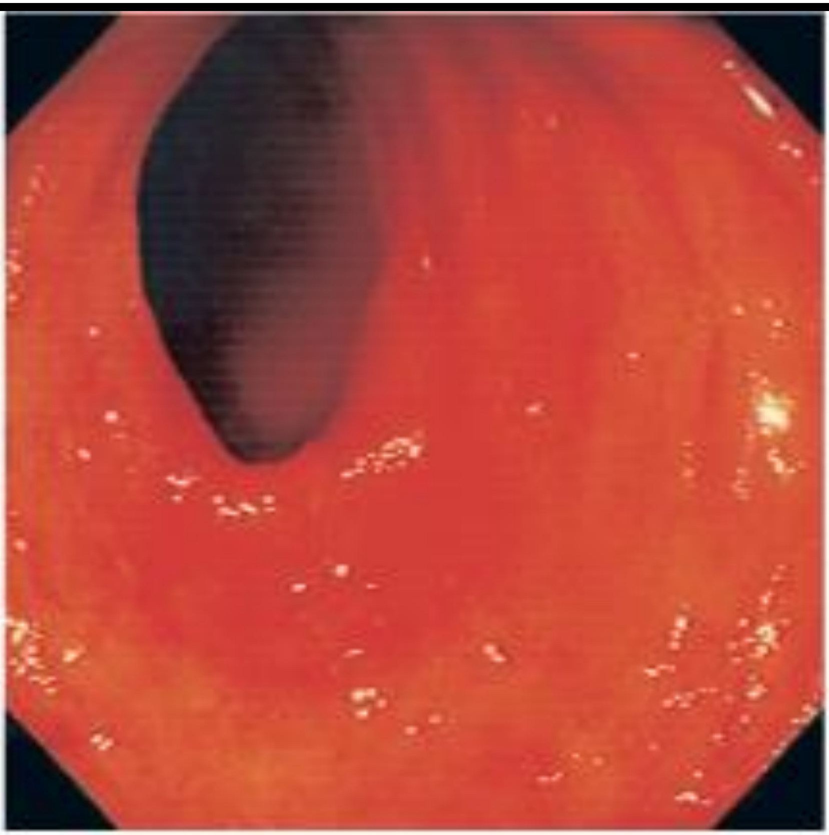


1	Greater omentum
2	Middle colic artery
3	Right colic artery
4	Duodenum
5	Ascending colon
6	Ileum
7	Transverse colon
8	Celiac ganglion
9	Duodenojejunal flexure
10	Superior mesenteric vein
11	Superior mesenteric artery
12	Jejunum
13	Jejunal arteries
14	Ileal arteries

Vessels of abdominal organs, dissection of superior mesenteric artery and vein. Greater omentum and transverse colon are reflected.

Image from: Johannes W.Rohen; Chihiro Yokochi; Elke Lütjen-Drecoll. Color atlas of anatomy. 7th edition. Lippincott Williams & Wilkins 2011

Endoscopy: Terminal Ileum



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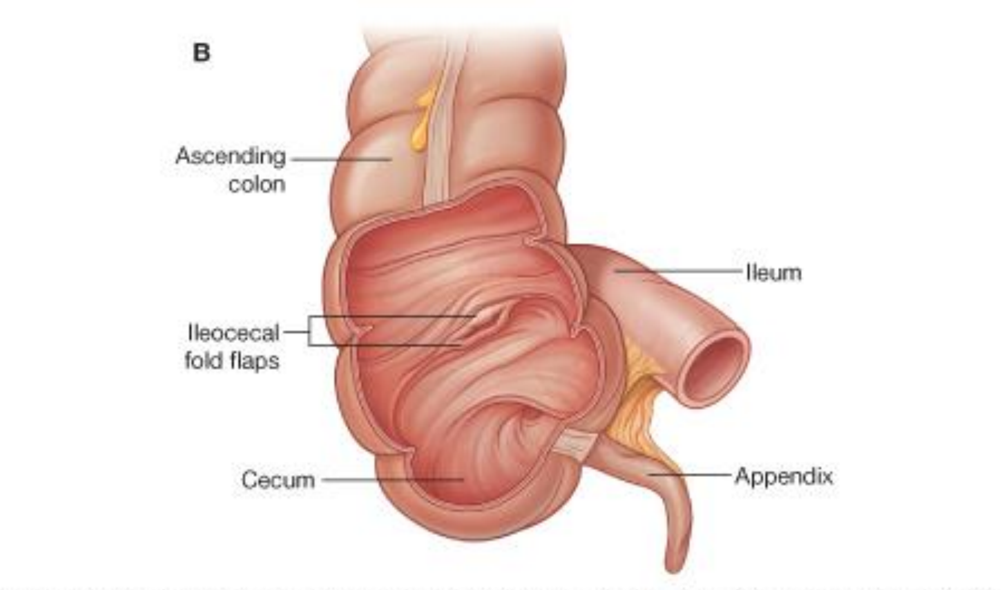
Ileocecal Fold (Junction)

- The ileum opens into the cecum.
- Two flaps projecting into the lumen of the large intestine surround the opening.
- Musculature from the ileum continues into each flap, forming a sphincter.
- Functions:
  - Prevention of reflux from the cecum to the ileum.
  - Regulation of the passage of contents from the ileum to the cecum

Ileocecal Fold (Junction)



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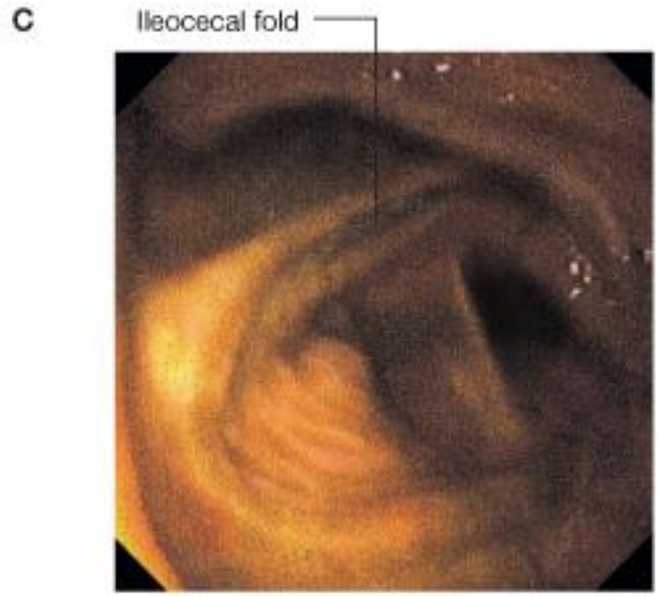

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Clinical Note: Meckel's Diverticulum

- It is the remnant of the proximal part of the yolk stalk (vitelline duct),
- It lies on the antimesenteric border of the ileum.
- It is an uncommon finding (occurring in approximately 2% of the population)

Differences between small and large intestine: internal features:

- **The mucous membrane of the small intestine has:**
  - **Permanent folds (plicae circulares).**
  - **Villi.**
  - **Aggregations of lymphoid tissue (Peyer's patches).**
- **The above features are absent in the large intestine.**

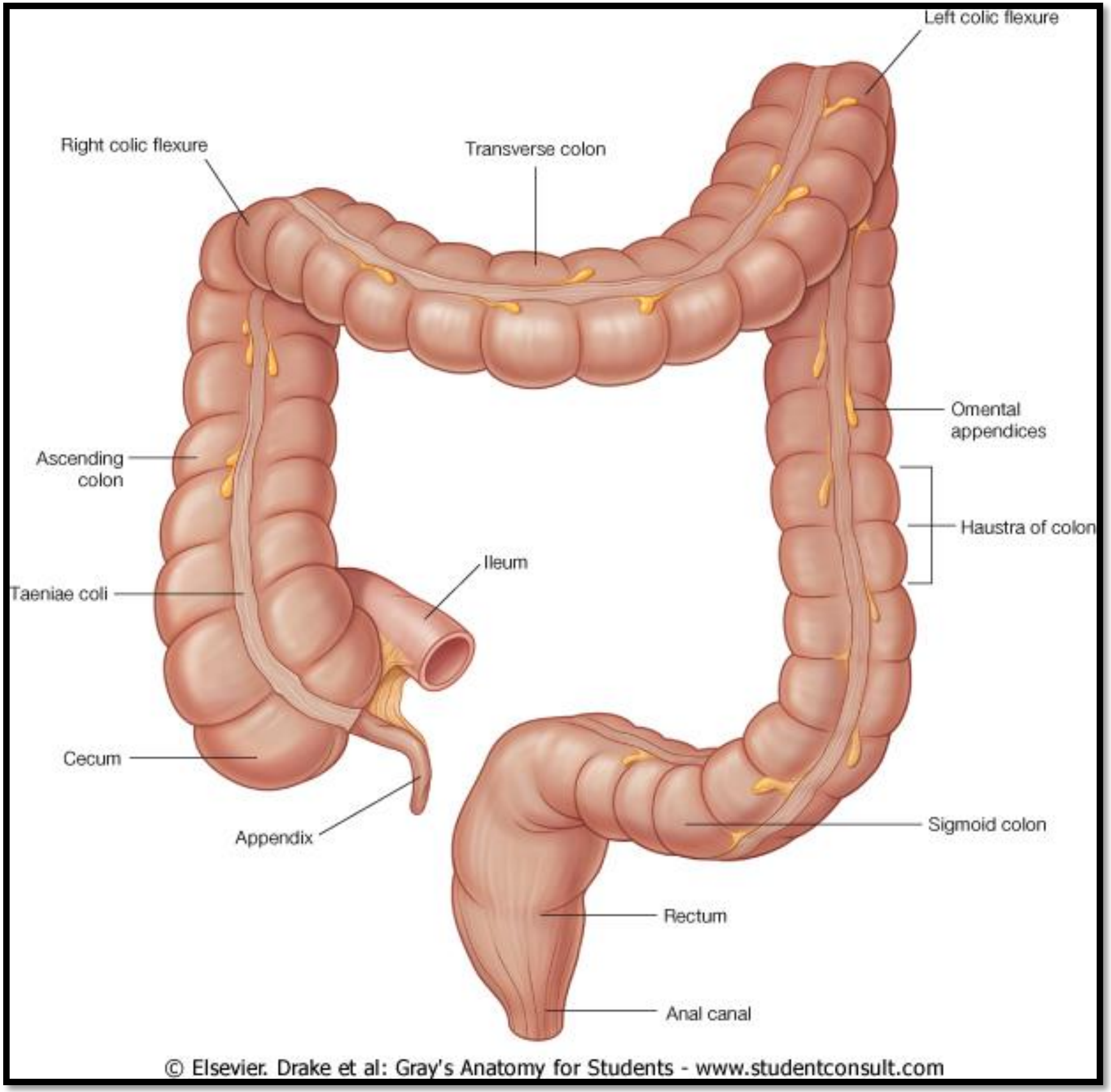
Lecture's map

- Small intestine:
  - Differences between jejunum and ileum.
  - Differences between small and large intestine: internal features.
- **Large intestine:**
  - **Differences between small and large intestine: external features.**
  - **Cecum.**
  - **Appendix.**
  - **Colon.**
- **Blood supply and innervation.**

LARGE INTESTINES

Consists of:

1) Cecum.
2) Appendix.
3) Colon.
4) Rectum.
5) Anal canal



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Differences between small and large intestine: external features:

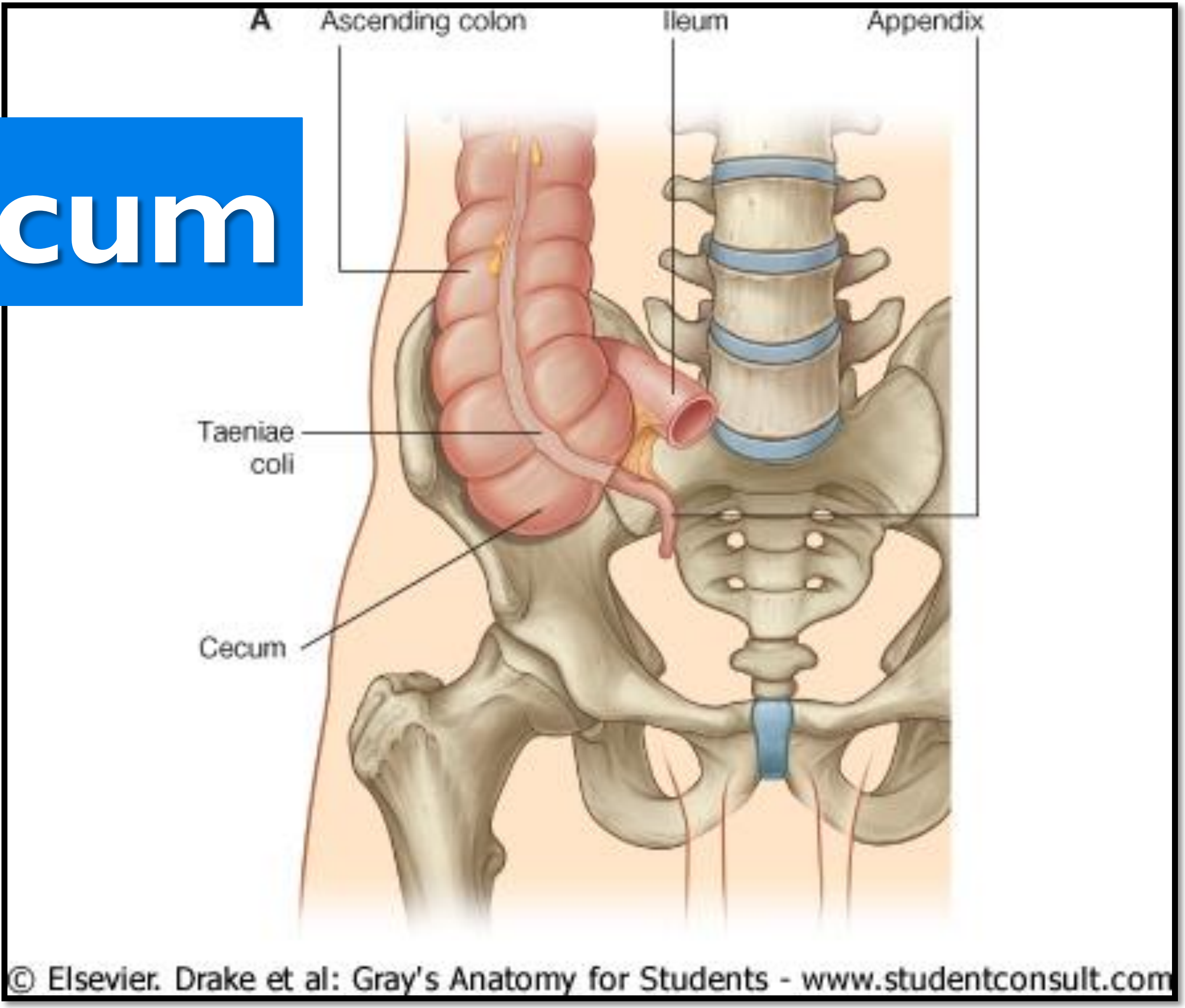
- **The wall is sacculated.**
- **The taeniae coli:**
  - **The longitudinal muscle is collected into three bands.**
- **The appendices epiploicae:**
  - **Are fatty tags.**

- **The above features are absent in the small intestine.**

The Cecum

- **It is the first part of the large intestine.**
- **Location: in the right iliac fossa.**
- **It is an intra-peritoneal structure.**

Cecum



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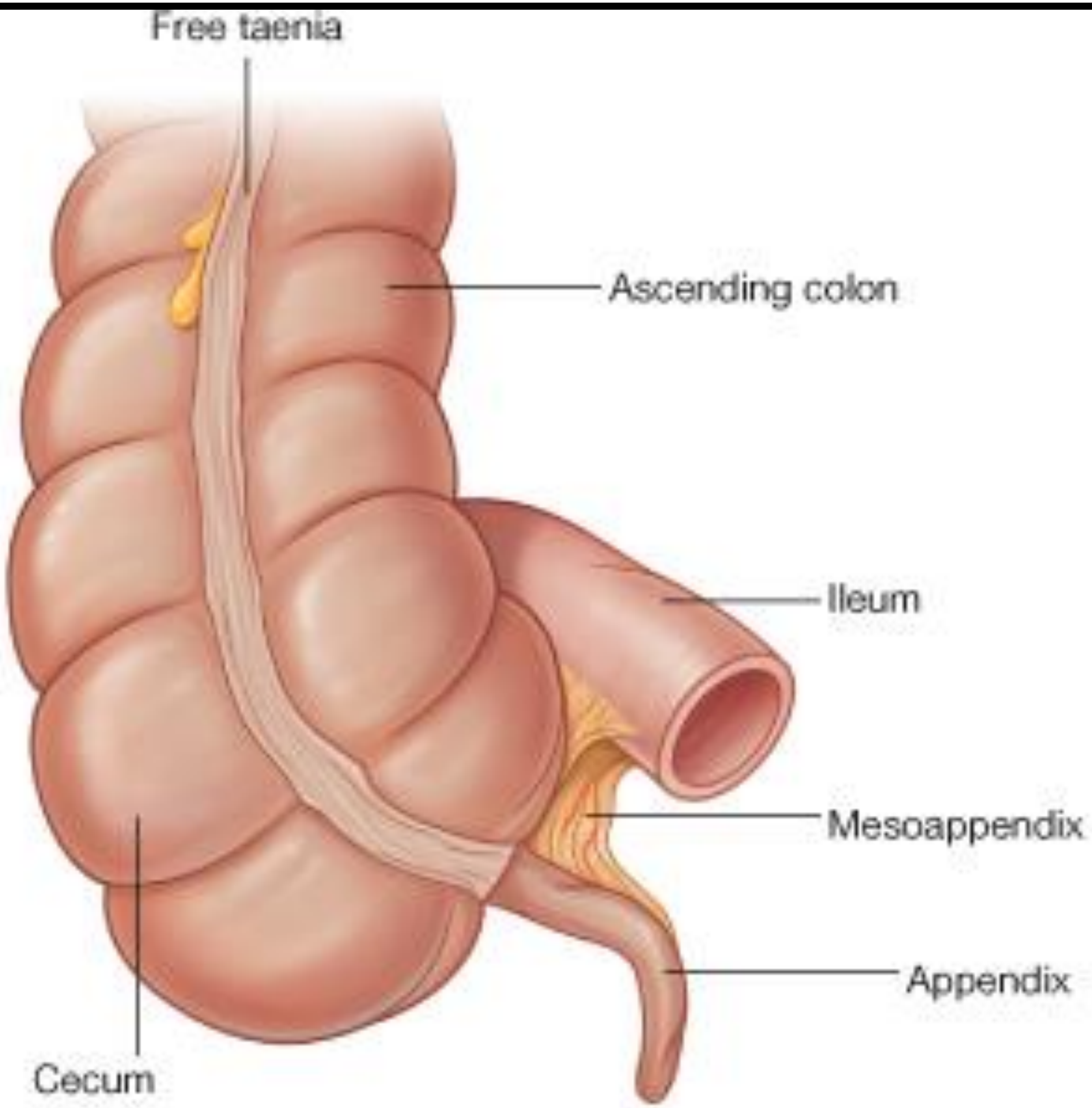
The Appendix

- It is a narrow, hollow tube connected to the cecum.
- It has large aggregations of lymphoid tissue in its walls and is suspended from the terminal ileum by the **mesoappendix**, which contains the **appendicular vessels**.
- The free taenia coli of the cecum leads directly to the base of the appendix.



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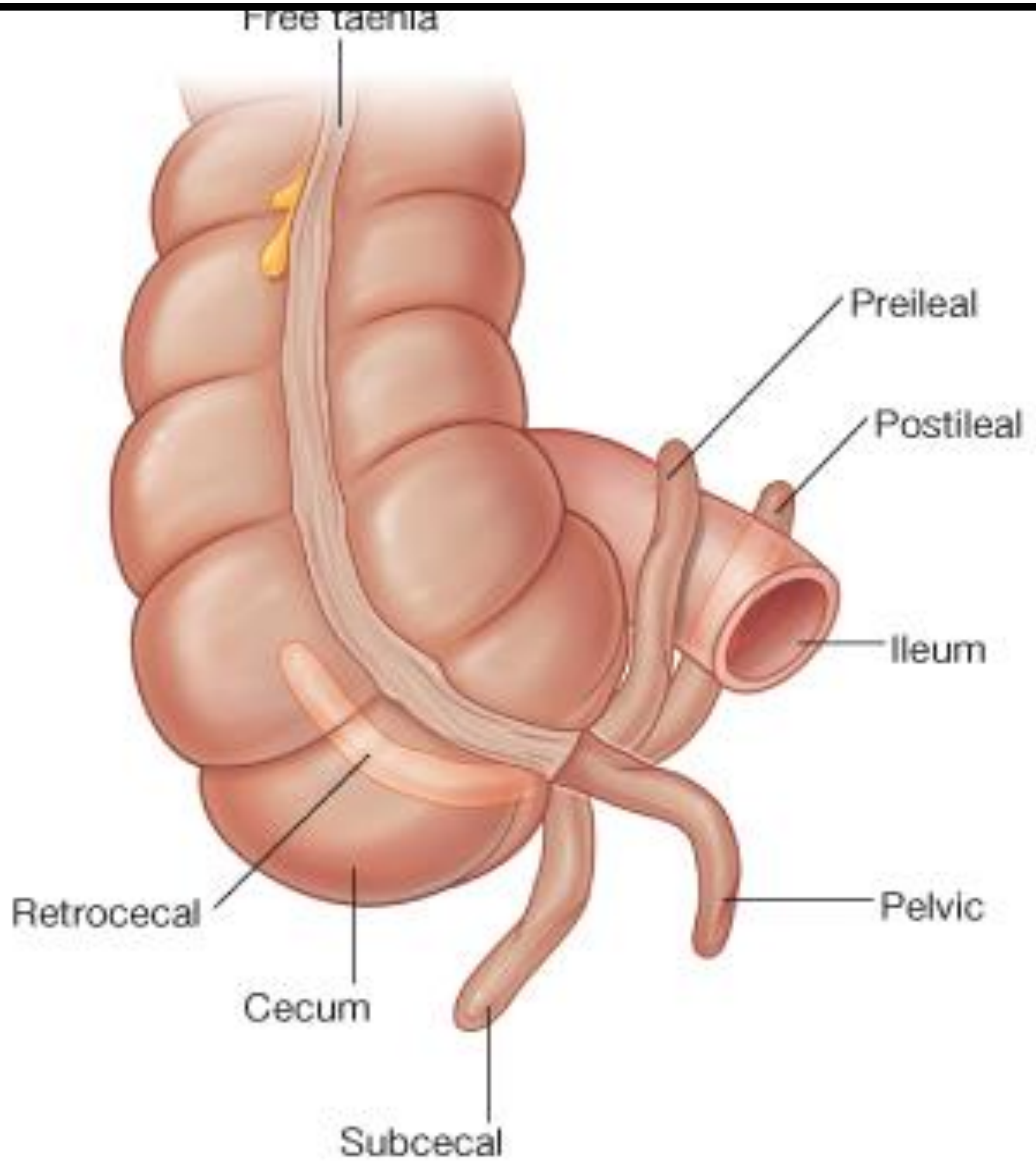
- **The location of the rest of the appendix is variable considerably:**
  - **Posterior to the cecum (retrocecal).**
  - **Below the cecum (subcecal).**
  - **Posterior to the lower ascending colon (retrocolic).**
  - **Suspended over the pelvic brim in a pelvic position.**
  - **Anterior to the terminal ileum (preileal).**
  - **Posterior to the terminal ileum (postileal).**



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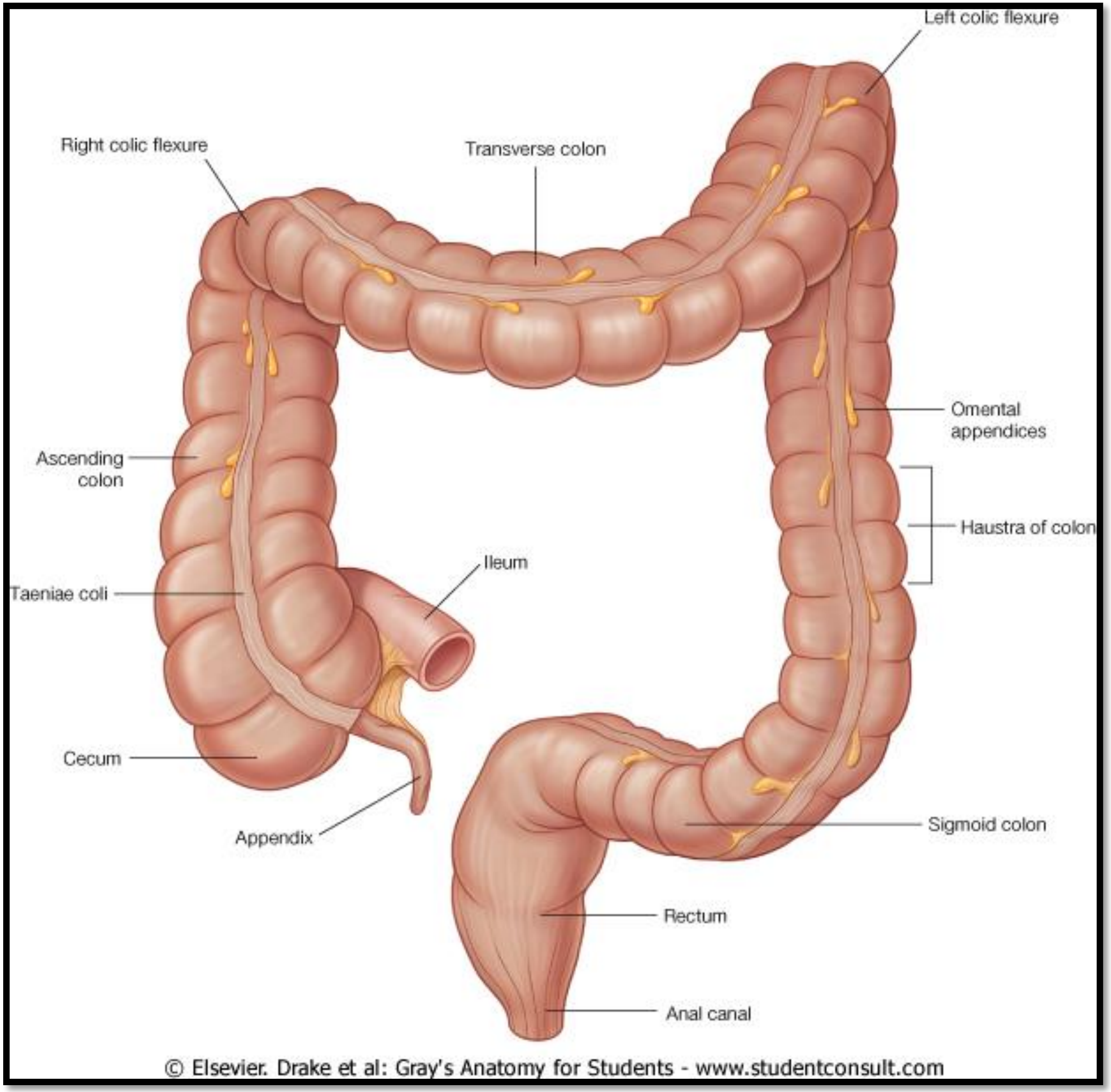
Surface Marking: Mcburney's Point

- The surface projection of the base of the appendix is at the junction of the lateral and middle one-thirds of a line from the anterior superior iliac spine to the umbilicus (**McBurney's point**).

The Colon



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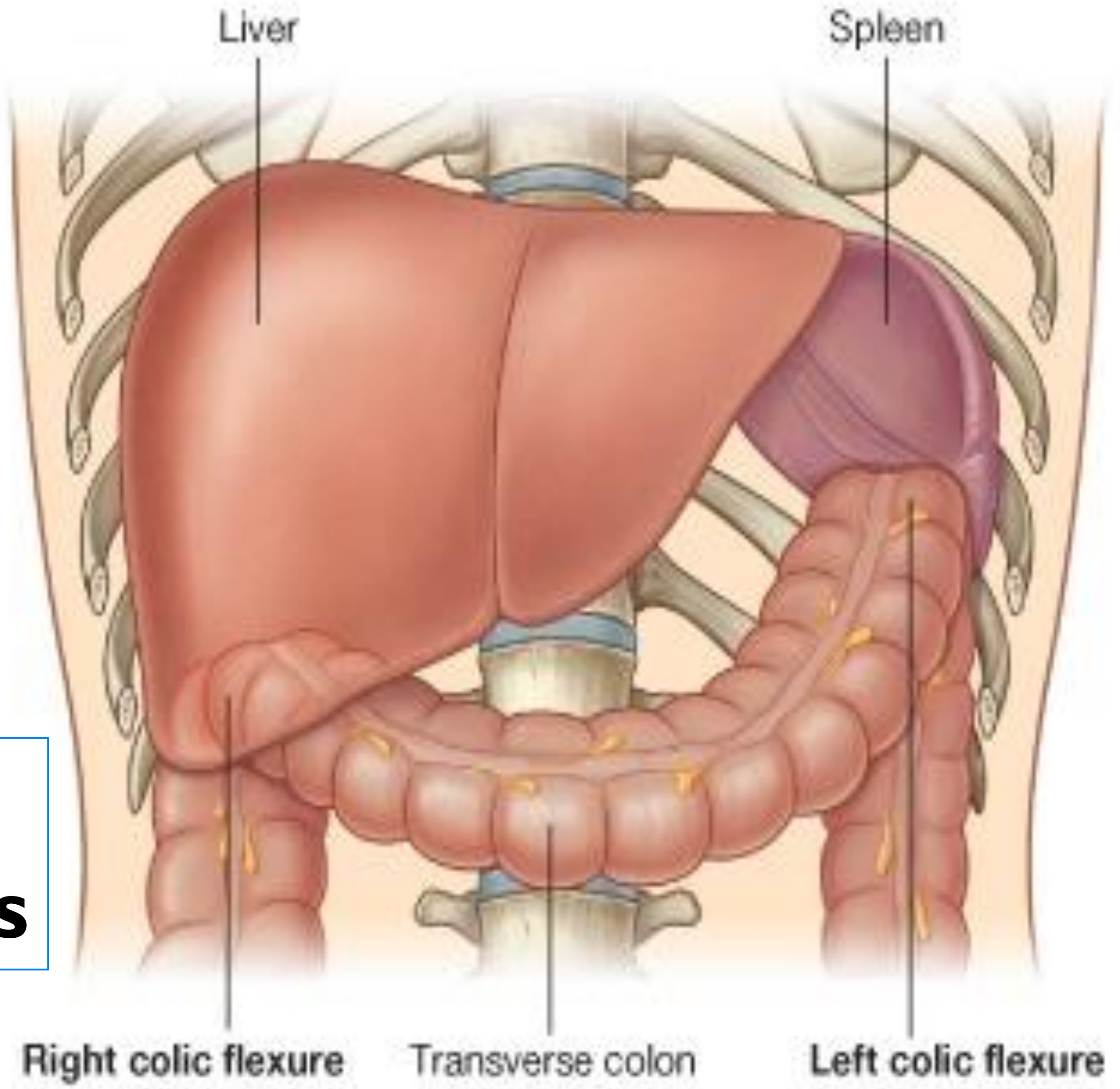
The Colon

- **Ascending colon.**
  - **(Secondarily retroperitoneal)**
- **Transvesre colon.**
  - **(Intraperitoneal)**
- **Descending colon.**
  - **(Secondarily retroperitoneal)**
- **Sigmoid colon.**
  - **(Intraperitoneal)**

Colic Flexures



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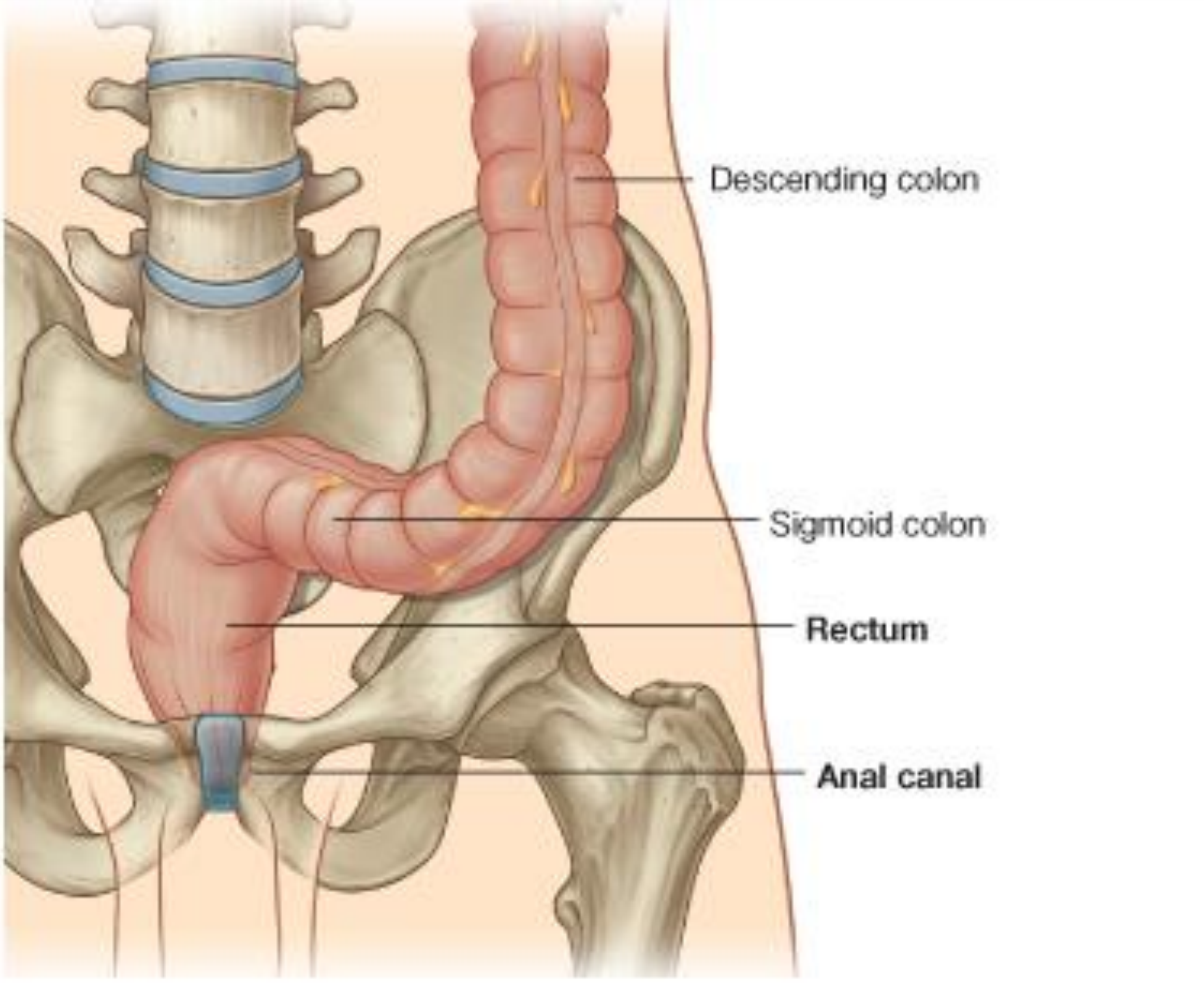
- **The right colic flexure :**
  - **At the junction of the ascending and transverse colon.**
  - **Relation: just inferior to the right lobe of the liver.**
- **The left colic flexure:**
  - **At the junction of the transverse and descending colon.**
  - **Relation:**
    - **Inferior to the spleen.**
    - **Higher and more posterior than the right colic flexure.**
    - **Attached to the diaphragm by the phrenicocolic ligament.**

The Sigmoid Colon

- It begins above the pelvic inlet and extends to the level of vertebra SIII.
- This S-shaped structure is quite mobile except at its beginning and end.
- Between these points, it is suspended by the sigmoid mesocolon.



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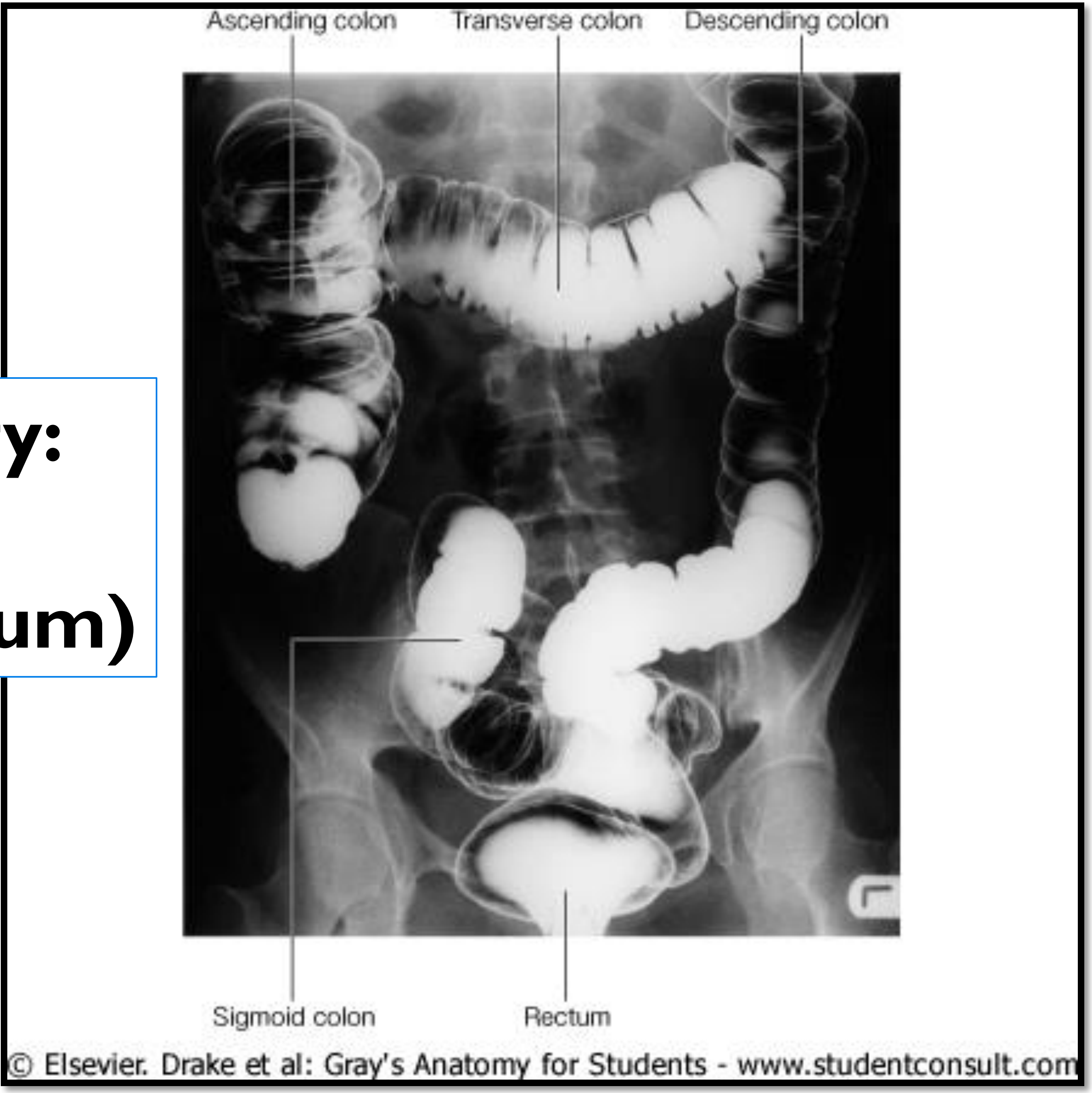
Radiology:
X-ray
(using barium)



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Lecture's map

- Small intestine:
  - Differences between jejunum and ileum.
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- Large intestine:
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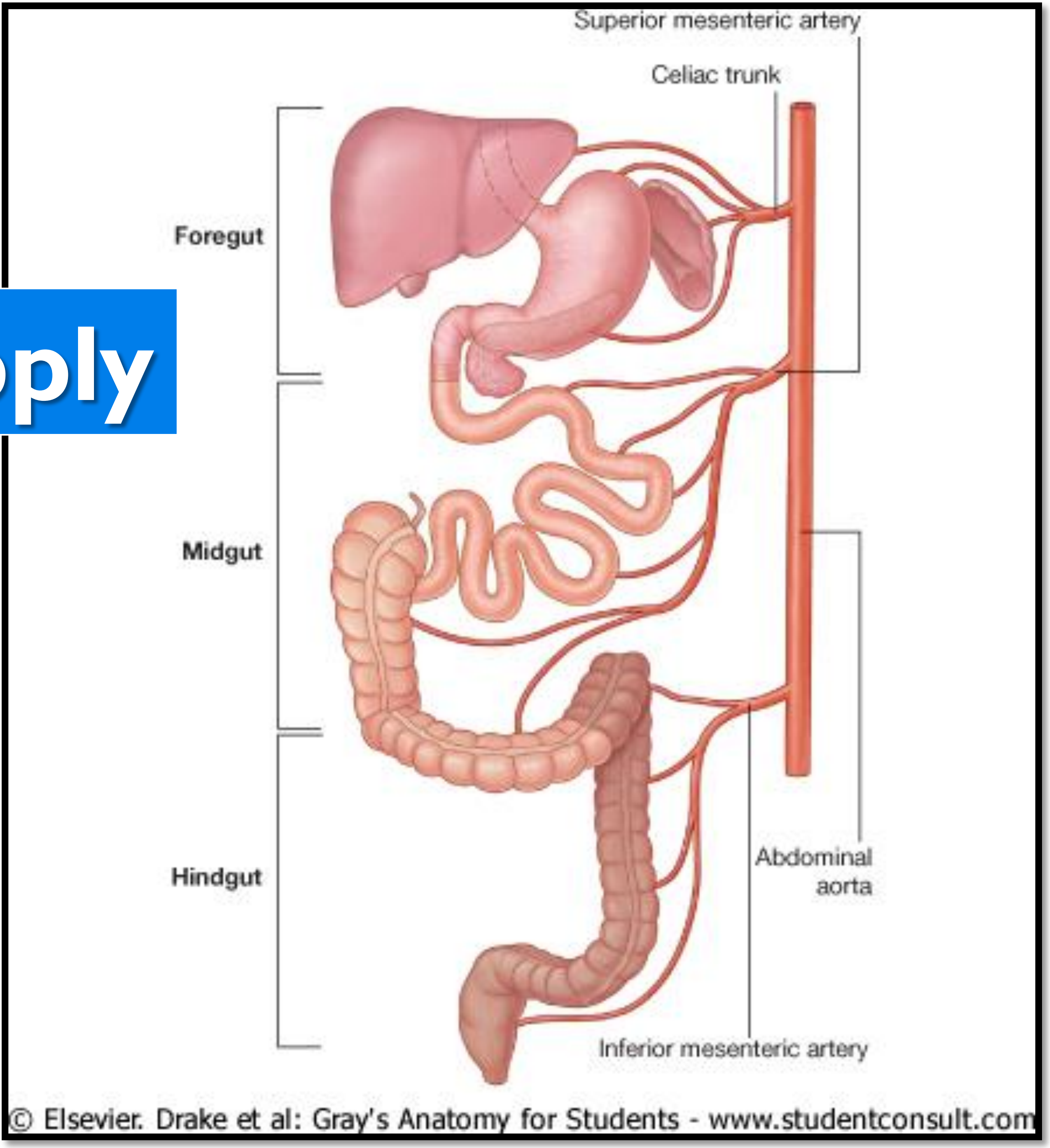
  - Cecum.
  - Appendix.
  - Colon.
- **Blood supply and innervation.**

BLOOD SUPPLY AND INNERVATION

Blood Supply



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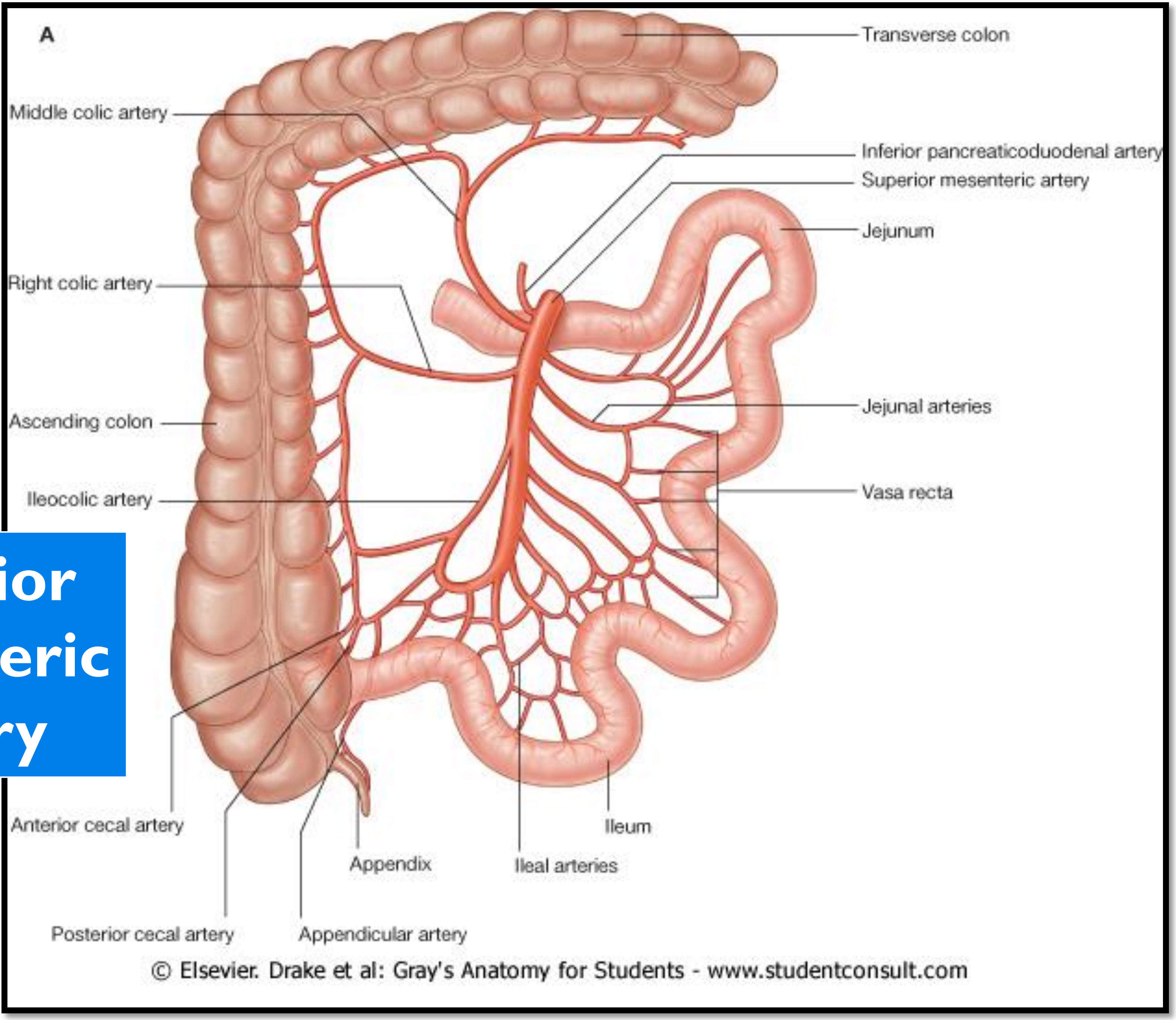
The superior mesenteric artery

- Jejunal branches.
- Ileal branches.
- Right colic.
- Middle colic.

Superior Mesenteric Artery



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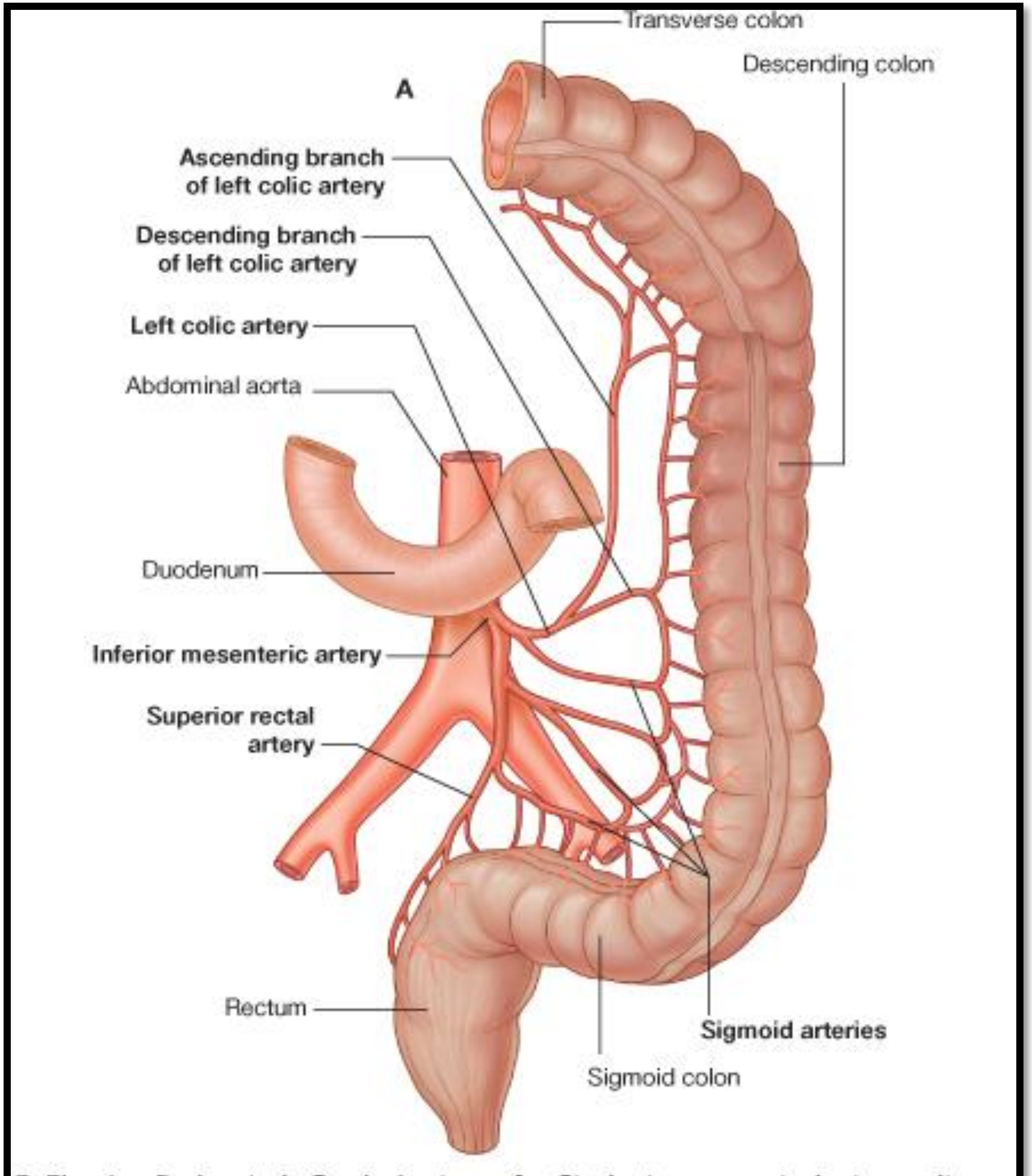
The inferior mesenteric artery

- **Left colic.**
- **Sigmoidal.**
- **Superior rectal.**

Inferior Mesenteric Artery



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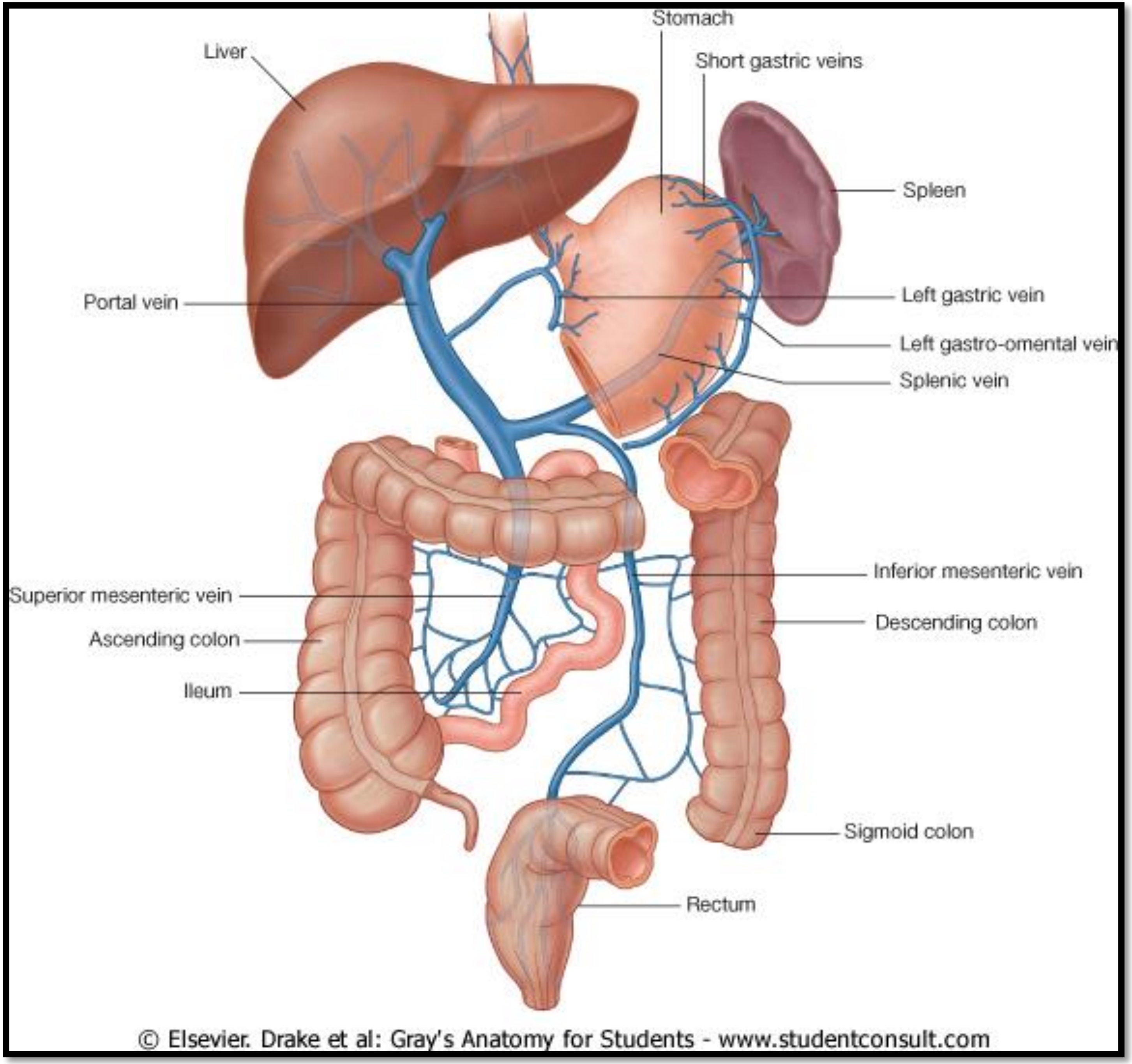
Venous Drainage



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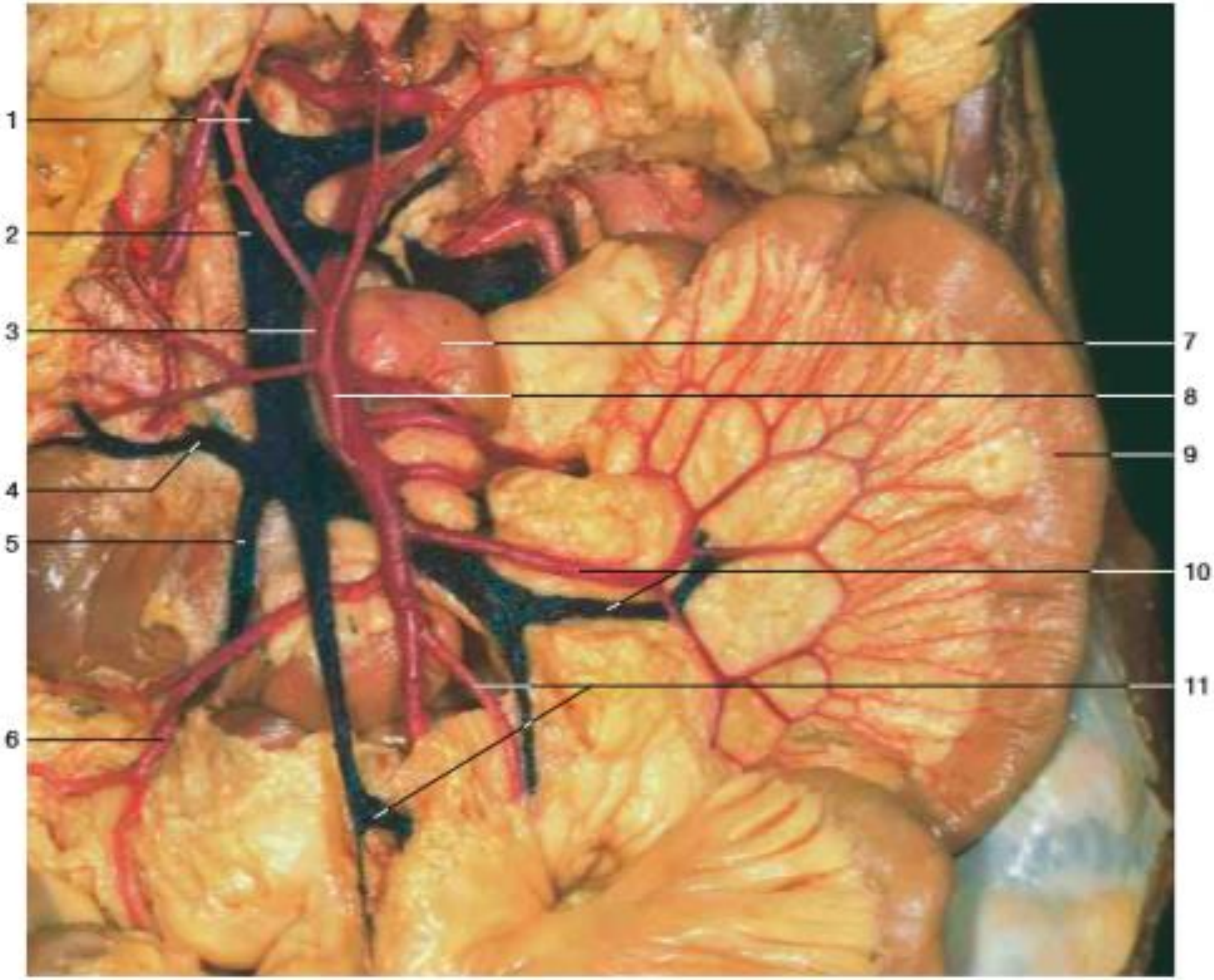
1 Portal vein
2 Superior mesenteric vein
3 Superior mesenteric artery
4 Right colic vein
5 Ileocolic vein
6 Ileocolic artery
7 Duodenojejunal flexure
8 Middle colic artery
9 Jejunum
10 Jejunal arteries and veins
11 Ileal arteries and veins
12 Inferior vena cava
13 Hepatic veins



Tributaries of portal vein (blue) and branches of superior mesenteric artery (red) (anterior aspect).

Image from: Johannes W.Rohen; Chihiro Yokochi; Elke Lütjen-Drecoll. Color atlas of anatomy. 7th edition. Lippincott Williams & Wilkins 2011

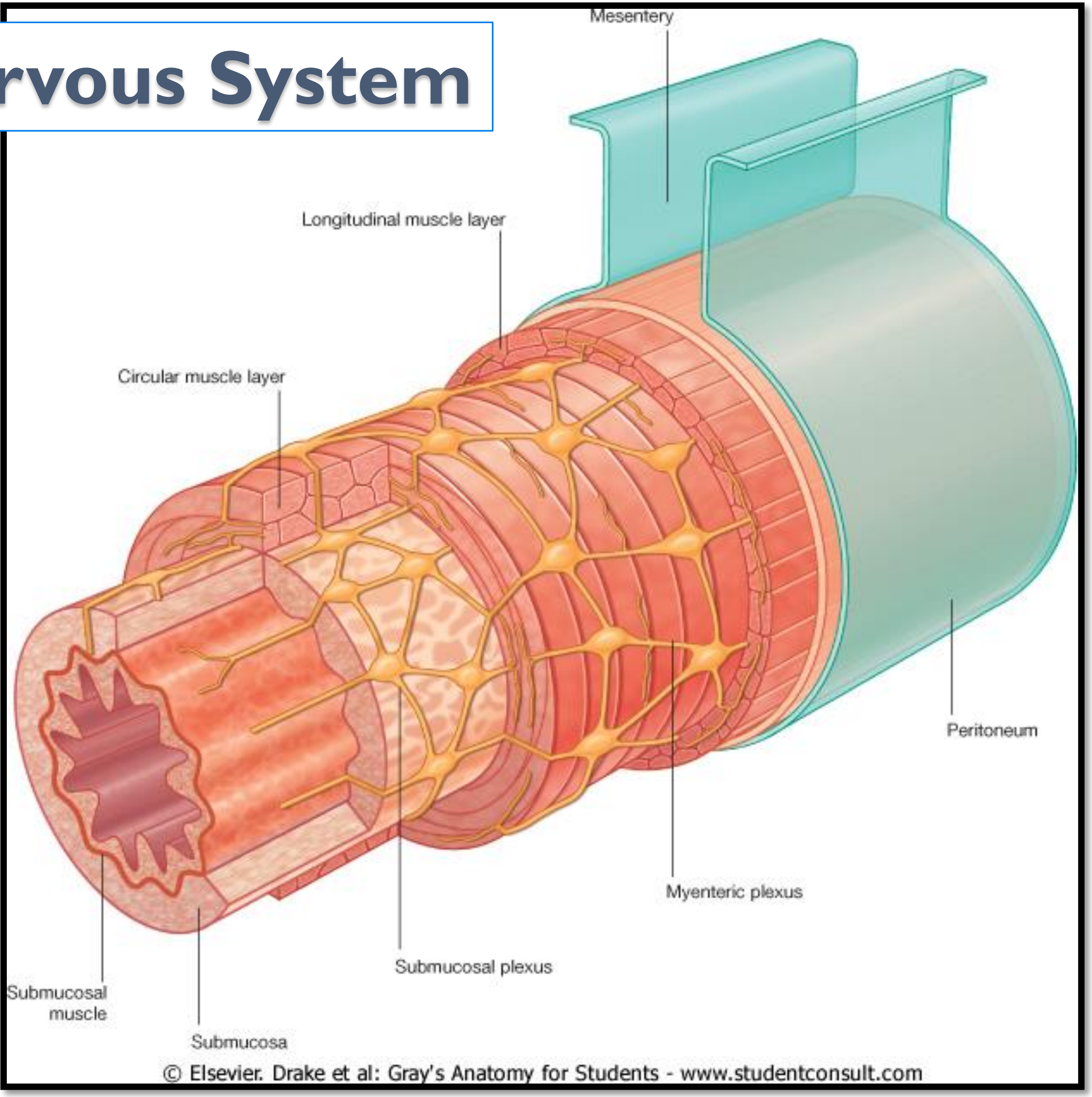
Clinical Note: Some Conditions

- **Volvulus:**
  - Because of its extreme mobility, the sigmoid colon sometimes rotates around its mesentery. This may correct itself spontaneously or the rotation may continue until the blood supply of the gut is cut off completely.
- **Intussusception:**
  - Intussusception is the telescoping of a proximal segment of the bowel into the lumen of an adjoining distal segment. there is a grave risk of cutting off the blood supply to the gut.

Enteric Nervous System

- It consists of two interconnected plexuses (the **myenteric** and **submucosal plexuses**) between the layers of the gastrointestinal wall.
- Functions: regulation and coordination of:
  - Gastric secretory activity.
  - Gastrointestinal blood flow.
  - Peristalsis.

Enteric Nervous System



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Enteric Nervous System

- Although the enteric system is generally independent of the central nervous system, it receives input from sympathetic and parasympathetic neurons that modifies its activities.

Summary: lecture's map

- Small intestine:
  - Differences between jejunum and ileum.
  - Differences between small and large intestine: internal features.
- Large intestine:
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  - Cecum.
  - Appendix.
  - Colon.
- Blood supply and innervation.

Please Try To Answer The Following Question:

- **Which one of the following is considered as a feature of the small intestine:**
  a) **Haustrations.**
  b) **Peyer's patches .**
  c) **The taeniae coli.**
  d) **The wall is sacculated.**
  e) **The appendices epiploicae.**

Please Try To Answer The Following Question

- **Which one of the followings is supplied by the inferior mesenteric artery:**
  a) **Cecum.**
  b) **Jejunum.**
  c) **The vermiform appendix.**
  d) **Sigmoid colon.**
  e) **Trasverse colon.**

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